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Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

In the Matter of

Co-Channel Protection  
Criteria for Part 90,  
Subpart S Stations  
Operating Above 800 MHz

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PR Docket No. 93-60  
RM-8028

To: The Commission

JOINT COMMENTS

Respectfully submitted,

WILLIAM L. BROWN, JR.

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SUMMARY

The National Association of Business and Educational Radio, Inc. ("NABER"), the American Mobile Telecommunications Association ("AMTA"), the Industrial Telecommunications Association, Inc. ("ITA") and Motorola, Inc. ("Motorola") ("the Joint Commentors") hereby jointly submit, the following Comments in above-captioned proceeding:

Through treaty with the Mexican government, applicants for 800 MHz licenses in the Mexican border region of the United States are granted frequencies offset by 12.5 kHz from the 800 MHz channels listed in Part 90. Each offset channel partially overlaps the bandwidth authorized to two primary 800 MHz channels. The Commission's Rules make no provision for protection from interference of these offset operations from primary channel operations. Therefore, the Joint Commentors propose to alter the Commission's Rules such that operations on offset channels are afforded interference protection from their adjacent, primary channels.

There may be situations in which the Short-Spacing Table

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representing Users, Private Carrier Paging licensees, Radio Dealers, Technicians and Specialized Mobile Radio operators. NABER's membership comprises over 6,000 of these businesses and service providers holding thousands of licenses in the private land mobile services.

For the past 19 years, NABER has been the recognized frequency coordinator in the 450-470 MHz and 470-512 MHz bands for the Business Radio Service. NABER is also the Commission's recognized frequency coordinator for the 800 MHz and 900 MHz Business Pools, 800 MHz "old" conventional channels for Business eligibles and conventional SMR Systems, and for the 929 MHz paging frequencies. In its Report and Order in PR Docket No. 83-737, the Commission designated NABER as the frequency coordinator for all Business Radio Service frequencies below 450 MHz and, in a joint effort with the International Municipal Signal Association ("IMSA") and the

~~Washington, D.C. Office of the Secretary of the Commission~~

Florida Fruit & Vegetable Association  
National Aggregates Association  
National Agricultural Aviation Association  
National Food Processors Association  
National Propane Gas Association  
National Ready-Mixed Concrete Association  
National Utility Contractors Association  
New England Fuel Institute  
United States Telephone Association

## **B. Background Of 800 MHz "Short-Spacing"**

In Docket No. 90-34, the Commission evaluated its procedures for granting waivers to permit spacings of less than seventy (70) miles between co-channel SMR Pool systems. In the proceeding, the Commission proposed to create standardized rules for short-spacing.<sup>2</sup>

In its Comments and Reply Comments in response to the Further Notice of Proposed Rule Making, the SMR industry proposed that the Commission require that an applicant ensure that the 22 dB $\mu$  F(50,10) contour of the interfering station does not overlap the 40 dB $\mu$  F(50,50) contour of the existing station.<sup>3</sup>

In response to such comments, the Commission adopted the 40/22 dB $\mu$  analysis method and developed a short-spacing "chart" which permits applicants to locate less than seventy (70) miles from co-channel systems based upon protecting the existing system's hypothetical parameters of 1000 watts ERP and 1000 feet HAAT.<sup>4</sup> The Commission stated that it would continue to grant waivers based upon a 40/30 dB $\mu$  analysis where appropriate.<sup>5</sup>

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<sup>2</sup>Further Notice of Proposed Rule Making, PR Docket No. 90-34, 6 FCC Rcd 975 (1991).

<sup>3</sup>The SMR industry originally proposed a 40/23 dB $\mu$  contour analysis. However, after further meetings with technical personnel and representatives of other organizations, the industry determined that a 40/22 dB $\mu$  analysis was more appropriate.

<sup>4</sup>Report and Order, PR Docket No. 90-34, 68 RR 2d 968 (1991). The new chart is codified at 47 C.F.R. §90.621(b)(4).

<sup>5</sup>Report and Order at n. 44. The Commission statement that it will continue to grant waivers based upon a 40/30 dB $\mu$  analysis is the basis of Petitions for Reconsideration filed by NABER, Motorola, AMTA and others.

In adopting the new rule, the Commission in the Report and Order recognized that the 40/30 dB $\mu$  analysis is not "responsive to contemporary SMR operating conditions".<sup>6</sup> The Commission agreed with the SMR industry that the "significant technological advancements in transmission methods and radio design have enabled reliable land mobile communications to extend beyond those areas anticipated in 1974 when the 40/30 dB $\mu$  criteria were developed."<sup>7</sup> However, the Commission did not at that time amend co-channel spacing requirements for the other 800 MHz and 900 MHz pools.

### C. NABER and Motorola Petitions

On March 6, 1992, NABER filed a Petition for Rule Making seeking to amend the co-channel spacing requirements for the Business and General Category channels. As noted by NABER, co-channel spacings for the Business and General Category frequencies are governed by Section 90.621(c) and (d) of the Commission's Rules. Instead of a seventy (70) mile rule, the rule states that frequency advisory committees will attempt to provide 40/30 dB $\mu$  protection for co-channel systems. The rule further states that this protection criteria will "typically" result in separations of seventy (70) miles.<sup>8</sup>

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<sup>6</sup>Report and Order at para. 13.

<sup>7</sup>Id.

<sup>8</sup>Several non-SMR parties requested in PR Docket No. 90-34 that the Commission also amend Section 90.621(c) and (d) during that proceeding, the Commission found that the request was outside the scope of the proceeding. Report and Order at n. 23.

Therefore, NABER requested that the Commission amend Sections 90.621(c) and (d) to require 40/22 dBμ contour protection. NABER proposed that the amendment of Sections 90.621(c) and (d) conform the General Category and Business Pool to the interference standards for 800 MHz and 900 MHz SMR Pool systems which the Commission found appropriate in PR Docket 90-34. NABER requested that the Commission act quickly on this proposal in order to avoid interference which will occur as the pools become more densely packed with systems as is the SMR Pool.

NABER's Petition attracted general support. The commenting parties agreed that all stations operating at 800/900 MHz should receive equivalent co-channel protection,<sup>9</sup> and that a 40/22 dBu standard was appropriate given improved receiver sensitivity, increased portable usage, and greater numbers of wide-area systems since the original 800 MHz separation criteria had been established.<sup>10</sup>

On October 21, 1992, Motorola filed a Petition for Partial Further Reconsideration. In its Petition, Motorola provided the Commission with additional detail as to the inadequacies of the

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<sup>9</sup>AMTA recommended that any FCC action on NABER's Petition also address the continued availability of 40/30 dBu waivers on SMR frequencies. The Commission resolved that issue independently in an Order stating that any applications requesting a waiver of FCC Rule Section 90.621(b) would be returned without action. Order, DA 92-1570 (November 16, 1992).

<sup>10</sup>See, Second Report and Order, Docket No. 18262, 46 FCC 2d 752 (1974). The Commission anticipated that a 40/30 dBu analysis would provide the necessary level of interference protection, and that such an analysis would typically result in a minimum distance separation of 70 miles from stations operating at maximum permissible parameters.

40/30 dB $\mu$  contour protection. Motorola also provided detailed analysis of interference to and from mobile units. As a result of Motorola's Petition, on November 13, 1992, the Commission adopted an Order "freezing" the acceptance of new 40/30 dB $\mu$  based waivers.<sup>11</sup>

The instant Notice is responsive to a Petition for Rule Making ("Petition") filed by NABER requesting modification of the co-channel protection criteria for private land mobile systems utilizing 800/900 MHz Business or General Category frequencies, as well as the Petition for Further Partial Reconsideration filed by Motorola.

The instant Notice encompasses, and even expands upon, the relief requested by NABER and endorsed by the industry. The FCC proposes to adopt further refinements of the existing 40/22 dBu Table which defines SMR co-channel separation criteria, and to apply that Table to all 800/900 MHz frequencies. 47 C.F.R. §90.621(b)(4). It also requests comments on matters such as the use of alternative propagation prediction methodology, rather than the R-6602 curves on which the current separation standards are based, the appropriateness of distinguishing between stations in different geographic areas or those with atypical service area requirements, and the necessity of considering base/mobile as well as base-to-base interference potential.

The Joint Commentors support the objectives of NABER's Petition and Motorola's Petition for Partial Further Reconsideration and commend the FCC for proposing a separation

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<sup>11</sup>DA 92-1570, released November 16, 1992.

standard which will better protect existing and future 800/900 MHz systems from destructive interference. Each of these entities has independently urged the Commission to modify its interference criteria to reflect today's more advanced radio environment. Each has affirmed the superiority of the 40/22 dBu standard. Each also appreciates, however, the broad variety of frequency usages and system configurations in the multi-faceted private land mobile community. This wide range of users and uses warrants a regulatory structure simple enough to be understood and utilized easily by both the applicants and the resource-strained FCC staff, yet flexible enough to accommodate the atypical system design. The Joint Commentors believe that the framework proposed by the FCC, if modified in accordance with the recommendations detailed below, can be implemented through the combined efforts of the Commission, the frequencies coordinators and the industry to promote the efficient, interference-free use of this valuable spectrum.

## II. COMMENTS

### A. Co-Channel Separation Criteria

The R-6602 curves have been used over the years in order to determine signal strength levels at various distances, ERP's, and antenna heights. R-6602 Figures 29<sup>12</sup> and 30<sup>13</sup> are to be used in the UHF band. Figure 29 is used for a time and location probability of F(50,50), while Figure 30 is used for a time and location variability of F(50,10).

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<sup>12</sup>Attached hereto as Exhibit 1.

<sup>13</sup>Exhibit 2.

R-6602 Figure 26<sup>14</sup> is a family of curves which graphs the difference between the two curves (Figure 30 - Figure 29). All of these curves were drawn assuming the receiver antenna height is constant at 30 feet. It is common procedure to apply a 9 dB height/gain correction factor to these curves for mobile applications because receiver antenna heights are much less than 30 feet.

Figure 26 clearly shows that the difference between figures 29 and 30 is quite dependent upon the transmitter antenna height. It is also true that as the receiving antenna height is reduced from 30 feet to something more typical for land mobile applications, a similar phenomenon occurs. That is to say, in addition to a correction for height/gain (the 9 dB typically used) a revision to figure 26 is also necessary when applying these procedures to land mobile. The reason is that at 30 feet height the antenna is nearly always in the clear relative to nearby scatterers and obstructions. At typical mobile antenna heights this is not the case. Therefore, it is generally found that using the R-6602 figure 30, the F(50,10) curve to determine interference contour distances works fairly well at large distances, but fails at shorter distances. The results are inaccurate at distances shorter than about 40 miles. Such distances are also most often used in land mobile applications. It is suggested, therefore, that a constant correction factor be applied to the F(50,50) curve for

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<sup>14</sup>Exhibit 3.

determining the interference contour distance, and that the use of the F(50,10) curve be abandoned.

#### B. Proposed Short-Spacing Table

Described below is an alternate method to derive a minimum co-channel spacing table for use in the 800 MHz band based upon the above discussion. The result of this table will be to place co-channel assignments sufficiently far apart to minimize interference. The table takes into account the DHAAT (directional height above average terrain) and ERP (effective radiated power) of both the proposed and existing stations. The F(50,50) curves were used for both the desired and undesired signals. The basic premise was to provide the same protection which has been used for years for full facility stations, i.e. 20 mile service area and 70 mile separation. Inspection of the F(50,50) curves shows that the C/I ratio is 31 dB between 1000 watt/1000 foot stations, and 32 dB between 500 watt/500 foot stations. Therefore, a ratio of 30 dB, with desired and undesired distances both taken from the F(50,50) curves will result in separations very much the same as past procedures for full facility stations, and much more accurate results for reduced facilities.

When the 9 dB height/gain correction is added to both the desired and undesired, for full facility cases, the F(50,50) curves are entered at 49 dB for the desired, and 19 dB for the interferer. The table is derived in such a way that the power increments for both the existing and proposed stations are in 3 dB increments. In the case of the proposed station, DHAAT increments are also in

3 dB increments.<sup>15</sup> A conv of the R-6602 F(50.50) curves for UHF is

In order to eliminate the potential for interference to and from these systems. the Joint Commentors propose additional

The Commission's Rules should consider all areas of the country with high elevation sites, instead of developing new Rules on an ad hoc basis each time new areas are identified.

The Joint Commentors propose three alternatives to provide additional protection to antenna sites with high HAATs. Once the Commission has determined a preferred method of handling SMR applications, the coordinators will employ the same criteria as a guideline.

1. DHAAT/Radio Horizon Method

- a. If the HAAT of the antenna site is greater than 1000

California and Washington, and eliminate footnote 1 with respect to the sites in southern California.

e. The calculations should be performed for both directions. If the applicant is willing to agree to accept an overlap of the existing station's 10 dB $\mu$  F(50,50) contour with the applicant's 40 dB $\mu$  F(50,50) contour, the applicant must specifically state this acceptance and provide a rationale.

## 2. DHAAT/Linear Method

a. Locate all co-channel users within 105 miles of the proposed facility.

b. Calculate the DHAAT of each existing user toward the proposed system and visa versa, as detailed in Part 90.

c. Using the Short-Spacing Table, locate the approximate DHAAT and ERP values for the proposed and existing stations.

d. For DHAAT values greater than 1500 feet, use the required separation for 1000 feet and add one mile of additional protection for every 100 feet of DHAAT above 1500 feet.

e. Assuming a 70 mile separation for systems licensed at 1000 feet, the increased protection reaches a maximum at 5000 feet of 105 miles.

f. The antenna sites listed in footnote one would continue to be protected at 105 miles.

## 3. Fixed Mileage/HAAT Method

a. Add 35 miles protection to that listed in the short space table for all co-channel users with HAATs greater than 2000 feet.

Of the three methods listed above, Method 1 would be the most accurate, although Method 2 may be easier to implement. The Joint Commentors believe that Method 3, while the easiest to implement, is the least accurate, and may overprotect some systems and underprotect others.

**D. Protection Of Offset Operations In The Mexican Border Region**

Through treaty with the Mexican government, applicants for 800 MHz licenses in the Mexican border region of the United States are granted frequencies offset by 12.5 kHz from the 800 MHz channels listed in Part 90. The Commission negotiated with Mexico on the use of offset channels based upon its finding of an additional 10 dB of protection to co-channel systems through the use of offsets.

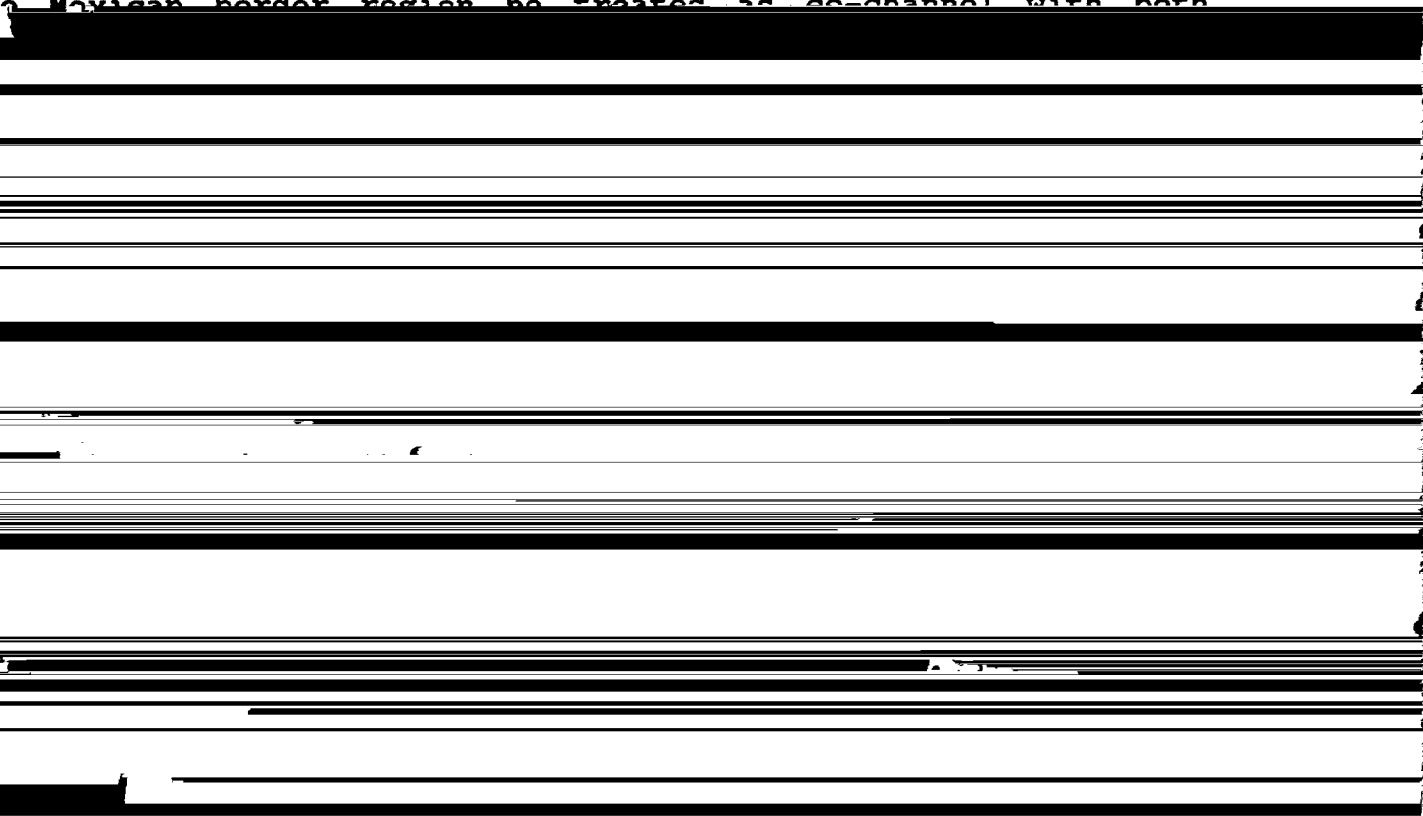
Each offset channel partially overlaps the bandwidth authorized to two primary 800 MHz channels. The Commission's Rules make no provision for protection from interference of these offset operations from primary channel operations. Previously, the Commission's Gettysburg Licensing Division utilized an informal policy of reviewing applications for spacing less than 50 miles from a system offset by 12.5 kHz. However, such review is no longer performed.

This situation has resulted in stations licensed within miles of other users operating on 12.5 kHz offsets. Therefore, the Joint Commentors propose to alter the Commission's Rules such that operations on offset channels are afforded interference protection from their adjacent, primary channels.

According to information supplied by Motorola, the Joint Commentors concur with the Commission's initial assessment that FM analog 25 kHz bandwidth transmissions are provided approximately 10 dB of protection from interference based on channel offset of 10 MHz. However, this level of protection drops by 2 dB for

Therefore, the 10 dB protection value from offsets only applies to analog versus analog cases. As more digital systems are installed, offset operations will appear as co-channel to primary 800 MHz channels and visa versa.

The possibility of frequency shifts in analog systems, along with the increased number of applications for digital systems, causes the Joint Commentors to recommend that offset operations in the Mexican border region be treated as co-channel with both



"campus" type system may be able to accept interference greater than anticipated by the Short-Spacing Table through the use of specialized antennas or wide-band amplifiers. If desired, an applicant should have the option of an "alternative showing", which requests authority for operation which would not normally be permitted under the Short-Spacing Table.

An "alternative" showing should be permitted under criteria similar to the criteria cited by the Commission in PR Docket No. 90-34 for 40/30 dB $\mu$  "waivers".<sup>19</sup> Specifically, applicants should include:

1. The identity of all co-channel stations;
2. Diagrams or charts showing the 40 dB $\mu$  F(50.50)

The Joint Commentors strongly believe that all applications using the "alternative showing" described above should not be treated as requests for rule waiver. Rather, a specific rule section in 47 C.F.R. §90.621 should be created permitting the "alternative showing" based upon this criteria. Such a rule section can account for situations where the Short-Spacing Table may not be appropriate, and which there clearly will not be any interference to the co-channel system.

It is the opinion of the Joint Commentors that the "alternative showing" will be rarely used. The overwhelming majority of the rule waivers which have been filed to date can be accommodated within the Short-Spacing Table proposed by the Joint Commentors. Therefore, it is unlikely that this option will result in any significant delay in the Commission's processes. Further, in the non-SMR Pools, the application will have received review by the frequency advisory committee, thereby further reducing the Commission's workload.

As discussed above, a copy of the "alternative showing" filing must be provided to co-channel licensees, and such licensees will thereafter have an opportunity to provide comments. If no comments are received, the Commission may process the application through its normal course of business, without the need to send the application for engineering review.

#### **F. 800/900 MHz Mobile Interference**

The one issue not addressed in most of the discussions of 800/900 MHz short spacing is the issue of mobile interference.

Much study and discussion has been focused on the base station talk out parameters and the potential for interference between base stations. In reality the major source of system degradation from interference does not occur at the mobile receiver but rather occurs at the base station receiver from co-channel mobile stations.

Both the current and proposed rules regarding 800/900 MHz spacing do not take into account potential interference from the co-channel mobiles of a short spaced co-channel system. When systems are spaced at 70 or more miles apart, normal earth curvature usually provides adequate protection from mobile interference. As the systems are brought closer together, the protection due to the curvature of the earth is reduced or eliminated. Unless there are significant terrain features between the systems, signals from the co-channel mobiles will be heard and the potential for destructive interference will exist.

Admittedly, as we increase the C/I ratio requirements from 40/30 to 40/22 and beyond, the problem of mobile interference is reduced. There are two sources of mobile interference problems in a short spaced system. First, most 800/900 MHz systems have usable coverage well in excess of their 40 dBu contour. This allows mobiles to operate closer to the co-channel system than the curves assume. Second, when a system is operated at significantly reduced parameters to facilitate construction of a short spaced system, the ERP of the mobile stations may actually exceed that of the system base stations, when the sensitivity advantage of the

base station preamp system and the base antenna gain are included. In these cases, the potential still exists for destructive interference from co-channel mobiles.

The proposed new table will help reduce the potential for mobile interference as it is based upon a much more conservative C/I ratio than the previous 40/30 or 40/22 standards. In order to provide additional protection from potential mobile interference, the Commission could consider that, in the case of a low system ERP (less than 100 watts), limiting the mobile ERP to a value 6 db less than the system ERP. As the market moves more towards the use of portables, this should not present a significant hardship to either the user or SMR operator.

Finally, as discussed above, the Joint Commentors are concerned that the advent of digital equipment may necessitate a review by the Commission as to whether the separation standards adopted in this proceeding are sufficient. While it is important that the Commission adopt new rules very quickly to permit the rapidly developing 800 MHz marketplace to continue its maturation, the Commission must be keenly aware of the differing engineering environment offered by digital technology. Therefore, it is specifically requested that the Commission adopt new rules as soon as possible in this proceeding, and revisit the separation standards shortly after digital equipment has become widely available.